Supersymmetry, black holes and holography in three dimensions

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Stellingen behorende bij het proefschrift

Supersymmetry, Black Holes and Holography in Three Dimensions

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- Despite its relative simplicity, 3D gravity reveals interesting physical properties.

Chapter 1

- In 3D, it is possible to obtain unitary modifications of Einstein's gravity by adding higher derivative terms to the Lagrangian. However, the dual boundary field theory turns out to be non-unitary.

Chapter 2

- For 3D supergravity theories to admit supersymmetric solutions with a timelike translational Killing vector, at least four supercharges must be introduced.

Chapter 2

- New Massive Gravity possesses two different off-shell supersymmetric extensions with four supercharges. Unitarity around the AdS spacetime is preserved in only one of them.

Chapter 3

- The $\mathcal{N} = (1, 1)$ supersymmetric extension of New Massive Gravity admits supersymmetric solutions with null and timelike translational Killing vectors. The rotating hairy black hole and the logarithmic black hole are solutions of the theory. However, the Lifshitz black hole is not.

Chapter 4

- The theory defined by the purely quadratic part of New Massive Gravity admits asymptotically locally flat black hole solutions which are conformally flat. Decomposing its field equations into two tensorial structures, all the conformally flat solutions of the theory can be classified.

Chapter 5